

Abstract

An investigation of the functional similarities and differences between a combline filter and an evanescent-mode waveguide filter is presented. The design theory of the two types of filters is outlined. Two filters are designed to operate at a centre frequency of 2 GHz with a 5% bandwidth using similar waveguide dimensions, but using the two different design theories. The bandpass characteristics of the two filters are then compared over the primary passband and over a broad range of frequencies to observe the stopband characteristics. It is shown that a combline filter with a large groundplane spacing behaves like an evanescent-mode waveguide filter but a difference in bandwidth exists between the two. Different aspects related to the manufacture of coaxial cavity filters are addressed with specific emphasis on cost reduction. The considerations to be made when choosing the right materials, manufacturing techniques and surface finishes for microwave coaxial cavity filters so that good performance is obtained while reducing the overall costs associated with manufacturing are discussed. The concept of Design for Manufacture (DFM) is discussed. Three combline filters are designed for reduced manufacturing cost, applying different changes in the physical structure to suit the specific manufacturing technique used. Two of these have the same design specifications, operating at a centre frequency of 1.3 GHz with a 10% bandwidth but are designed for manufacture using two different manufacturing techniques: milling and wire-cutting EDM. The third filter is designed for manufacture using a combination of the milling and wirecutting processes to have a bandwidth of 1.8% with the primary passband centred at 2.125 GHz. Problems encountered in manufacturing are explained, one of which results in the use of waterjet cutting for the manufacture of filters initially supposed to be manufactured using wirecutting EDM. Measurement results for the manufactured filters show a good agreement between the bandwidths of the 3D electromagnetic simulation results. The obtained results also show the effects of poor surface finishing and of deformations on the resonant frequency and the unloaded Q of the filters.